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USNCBC ltr, 24 Oct 1974

63-3-4

R 120 SUPPLEMENT

Technical Report

BEHAVIOR OF INSTRUMENTED PRESTRESSED CONCRETE PAVEMENT AT NAS LEMOORE, CALIFORNIA

7 May 1963

U. S. NAVAL CIVIL ENGINEERING LABORATORY

Port Hueneme, California

SUPPLEMENT TO TR-120, BEHAVIOR OF INSTRUMENTED PRESTRESSED CONCRETE PAVEMENT AT NAS LEMOORE, CALIFORNIA

Y-R011-01-013

Type C

by

J. A. Bishop

ABSTRACT

The observations reported in TR-120 are supplemented by further observations of the behavior with age and use of an instrumented prestressed concrete taxiway at NAS Lemoore. Data will continue to be taken annually.

PURPOSE

As indicated in TR-120, observations of coupler and strain meter data from the prestressed concrete taxiway at NAS Lemoore were to be made bimonthly during the first year of the pavement life and then semiannually for a period of two years. This supplement updates the data presented in TR-120 and describes the condition of the instrumentation and the pavement after two years of life and after the pavement has been in operational use for one year. It is planned to continue observation of the coupler loads and concrete strains on an annual basis.

SCOPE

Data taken since the publication of TR-120, and reported herein, include two sets of measurements: (1) the distribution of prestressing forces along longitudinal and transverse tendons as indicated by the instrumented couplers, and (2) longitudinal and transverse strains in the concrete as defined by the Carlson strain meters placed adjacent to the couplers. No load tests have been conducted on the pavement since the completion of those reported in TR-120. The latest observation of data consisted of an around-the-clock set of readings to determine the variation of coupler loads and concrete strains over a period of 24 hours.

RESULTS

Coupler loads and strains in the concrete during the periodic observations since July 1960 are presented as extensions of Tables I and II of TR-120. The last entry in each table represents the final readings of data taken during the 24-hour observations mentioned above. The manner in which the distribution of tendon forces in longitudinal tendon 16 has changed during the first two years of pavement life is indicated in Figure S-1. Figure S-2 shows the changes in transverse tendons during the same period. Figure S-3 shows the manner in which concrete strains as reflected by the Carlson strain meters adjacent to the couplers in tendon 16 have changed also. (No "design" strains can be plotted as these were not known prior to prestressing.) The variation of transverse strains is shown in Figure S-4. The variation of coupler load and concrete strains (at position B-16) with slab temperature, air temperature, and humidity over a 24-hour period is shown in Figure S-5.

DISCUSSION

Examination of Table I will indicate that over half of the couplers installed in the longitudinal tendons have become inoperative since the data taken in June 1961. Until that time all of the couplers were providing reasonably reliable information regarding tendon forces. For example, in June 1961 all five couplers in tendon 15 were performing satisfactorily, but by February 1962 none of the five was able to provide any data on the force in tendon 15. Similarly, three of the five couplers in tendon 17 have been incapacitated. The reason for the destruction of the data-providing capability of these instrumented couplers is not known, but it may be significant that the taxiway was put into operational use within a very short time after the June 1961 readings. Neither the couplers installed in the transverse tendons nor the Carlson strain meters embedded in the concrete appeared to have been damaged. The variation in longitudinal tendon forces with time as indicated by Figure S-1 appears to be typical of the change taking place in all three longitudinal tendons which were instrumented (compare with Figure 12 of TR-120). There has apparently been a substantial reduction in the tendon force at each end of the slab, whereas the force at the center of the slab has not decreased appreciably. As a matter of fact, the force indicated at the center is greater than at either end. The reason for this anomalous situation is not readily apparent, but it is probably related to friction between the tendons and their ducts, caused by the sagging and misalignment of the flexible ducts as mentioned in TR-120. It is not possible to predict the minimum value to which the force in tendon 16 will reduce, but it would appear conceivable that, if the trend continues, eventually a point would be reached at which the concrete in the area of tendon 16 would no longer be considered "prestressed." Whether or not this situation exists in the other 30 longitudinal tendons of the taxiway is, of course, not known, and it may be that the rather odd distribution of tendon forces over the length of the cable may be due to the binding of an instrumented coupler in its enclosing sheath. If this is the case, then the other tendons would not be so affected since they are continuous.

The 24-hour observations plotted in Figure S-5 reveal the effects, at one instrumentation position, of slab temperature and humidity changes on concrete strains and on coupler loads. It is seen that during the last half of the 24-hour period the slab temperature increased a maximum of 10 degrees (temperature was sensed by the strain meters embedded in the concrete). During the same period of time the relative humidity dropped a total of 32 percent. The air temperature more or less paralleled the slab temperature and will not be considered further. During the last half of the 24-hour period the compressive strain in the concrete sensed by the Carlson meters increased 44 microinches, and the coupler load decreased a total of 320 pounds.

If the modulus of elasticity of the concrete is assumed to be the same as at the time of construction, the 44-microinch change in strain represents a 176-psi increase in compressive stress. If the coefficient of expansion is assumed to be the same as the initial value, an increase of 10 degrees should result in an increase of 228 psi. The difference between these figures, 52 psi, must then be due to the drop in relative humidity, which would tend to shrink or shorten the slab.

Similarly, if the coefficient of expansion and the modulus of elasticity of the steel are assumed to be at their initial values, a 10-degree increase in temperature is the equivalent of a relaxation of 75 pounds in the tendon. The coupler, however, indicated a drop in coupler load of 320 pounds. The difference in these values, 245 pounds, must be the result of the shortening of the slab caused by the decrease in relative humidity.

It would appear, therefore, that the net effect of a decrease in relative humidity is a reduction in the amount of compressive stress that would be developed because of increased temperature, and a larger relaxation of the tendon force than would be developed by the same temperature rise.

In June 1962 it was observed that two spalled areas were present in the center lane of the taxiway and that some of the instrumentation was exposed. The spalling occurred immediately over the trumpets surrounding two of the couplers in the longitudinal tendons. One spall was about 14 inches in diameter at the surface and the other about 12 inches; each was approximately 2 inches deep. There was no way of determining specifically what had caused the spalling, nor was there any indication of whether the spalls occurred suddenly or gradually. It was apparent, however, that the trumpets were disrupted and the instrumented couplers within were clearly visible. Figure S-6 shows the spalled areas and the damage to the trumpets. The pavement was carefully inspected and no other evidence of distress was observed over any of the trumpets or instrumentation. The damaged areas were immediately patched since they were considered hazards to aircraft operation.

CONCLUSIONS

The conclusion expressed in TR-120 that the instrumented couplers and Carlson strain meters were satisfactory means of extracting data from the pavement is reiterated. It would appear that after two years of life, however, and after many of the couplers are no longer providing data, that in future prestressed pavement work the trumpets or sheaths surrounding the instrumented couplers should be much longer than were used at NAS Lemoore to obviate the possibility of the coupler binding on a trumpet end when the prestressing tendons are stretched.

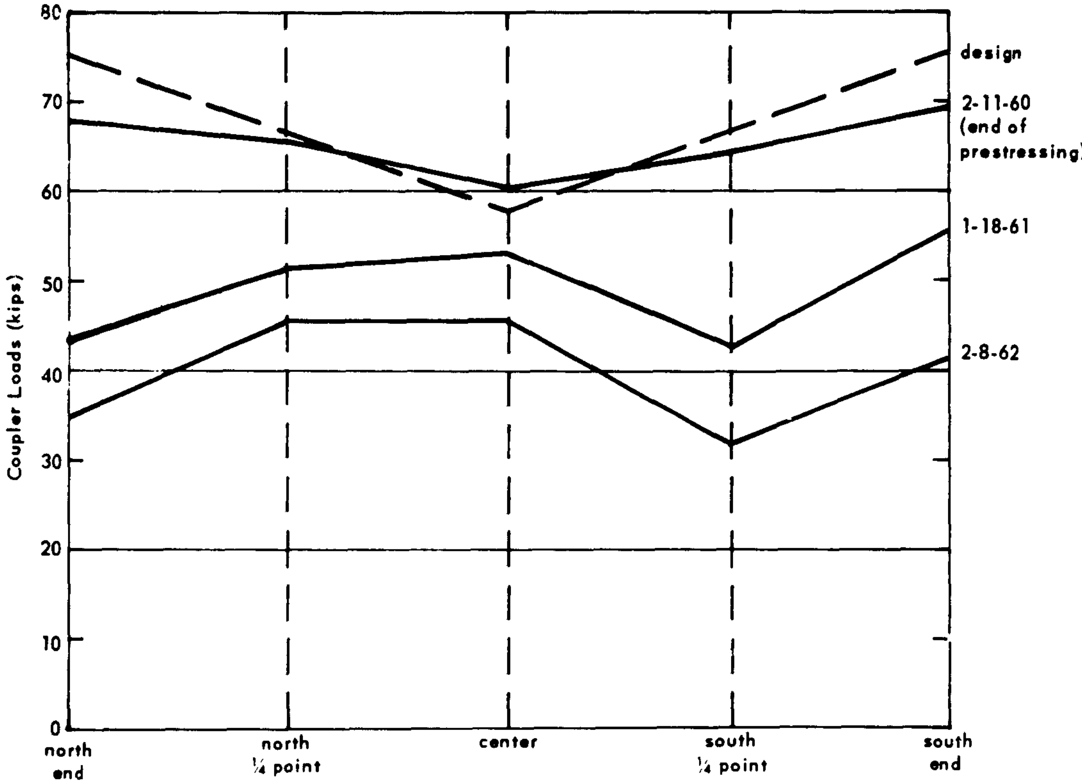


Figure S-1. Longitudinal coupler loads (coupler in tendon 16).

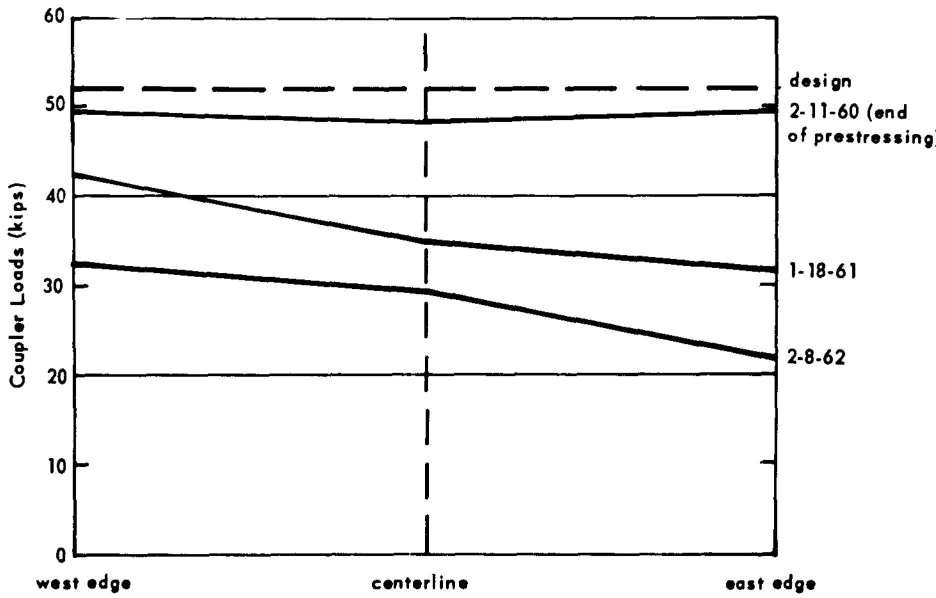


Figure S-2. Transverse coupler loads (averaged).

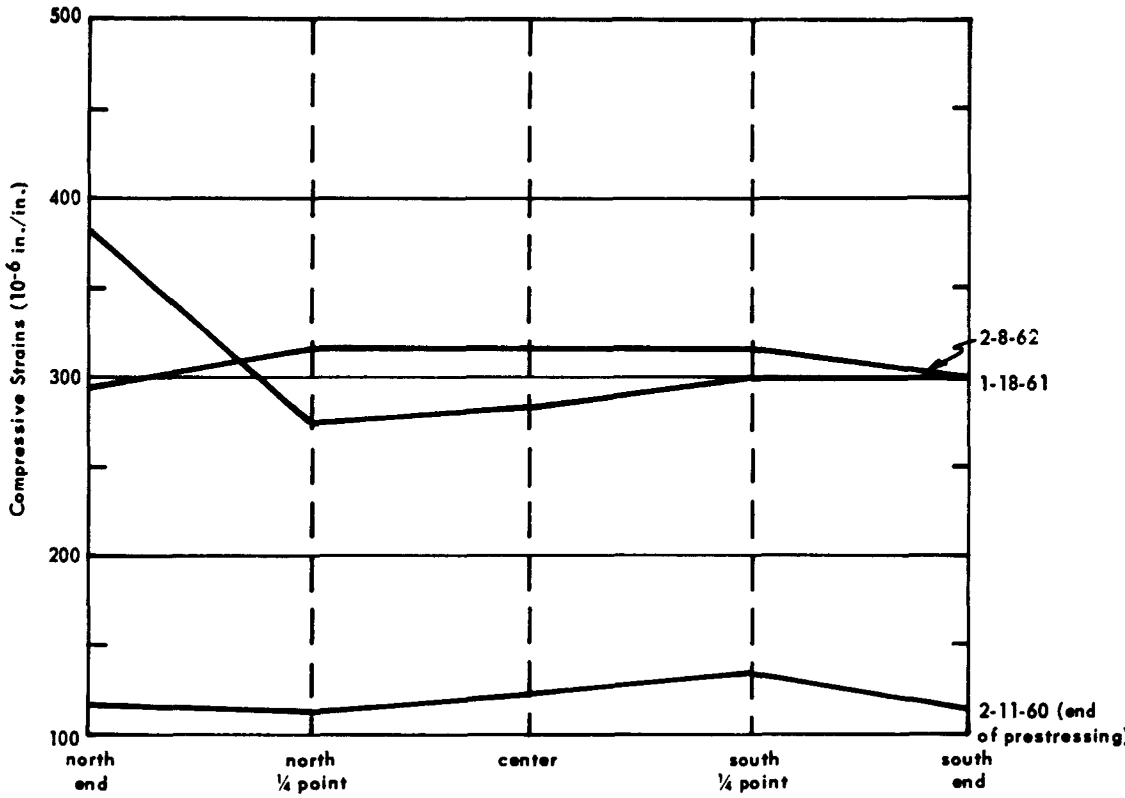


Figure S-3. Longitudinal strains in concrete (meters adjacent to tendon 16).

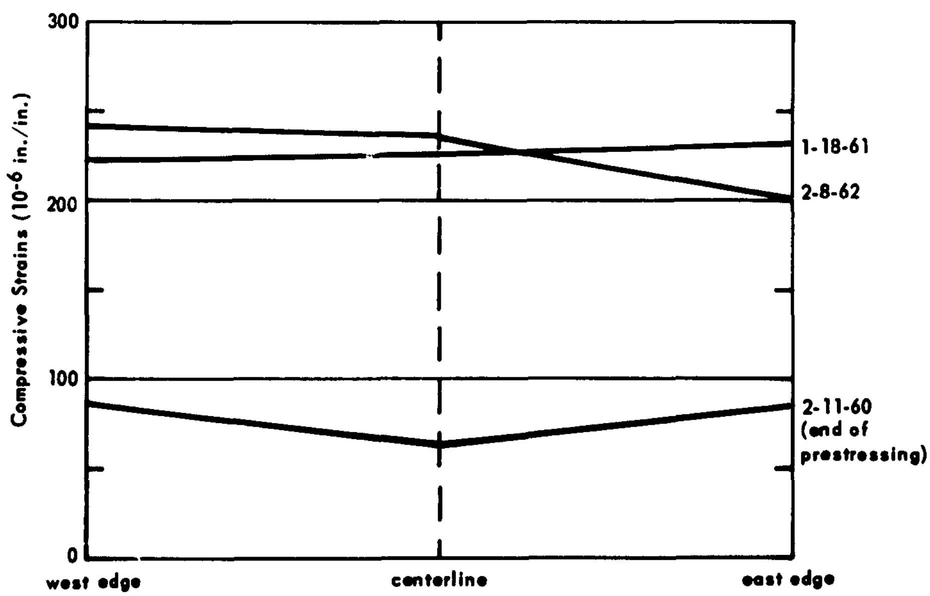


Figure S-4. Transverse strains in concrete (averaged).

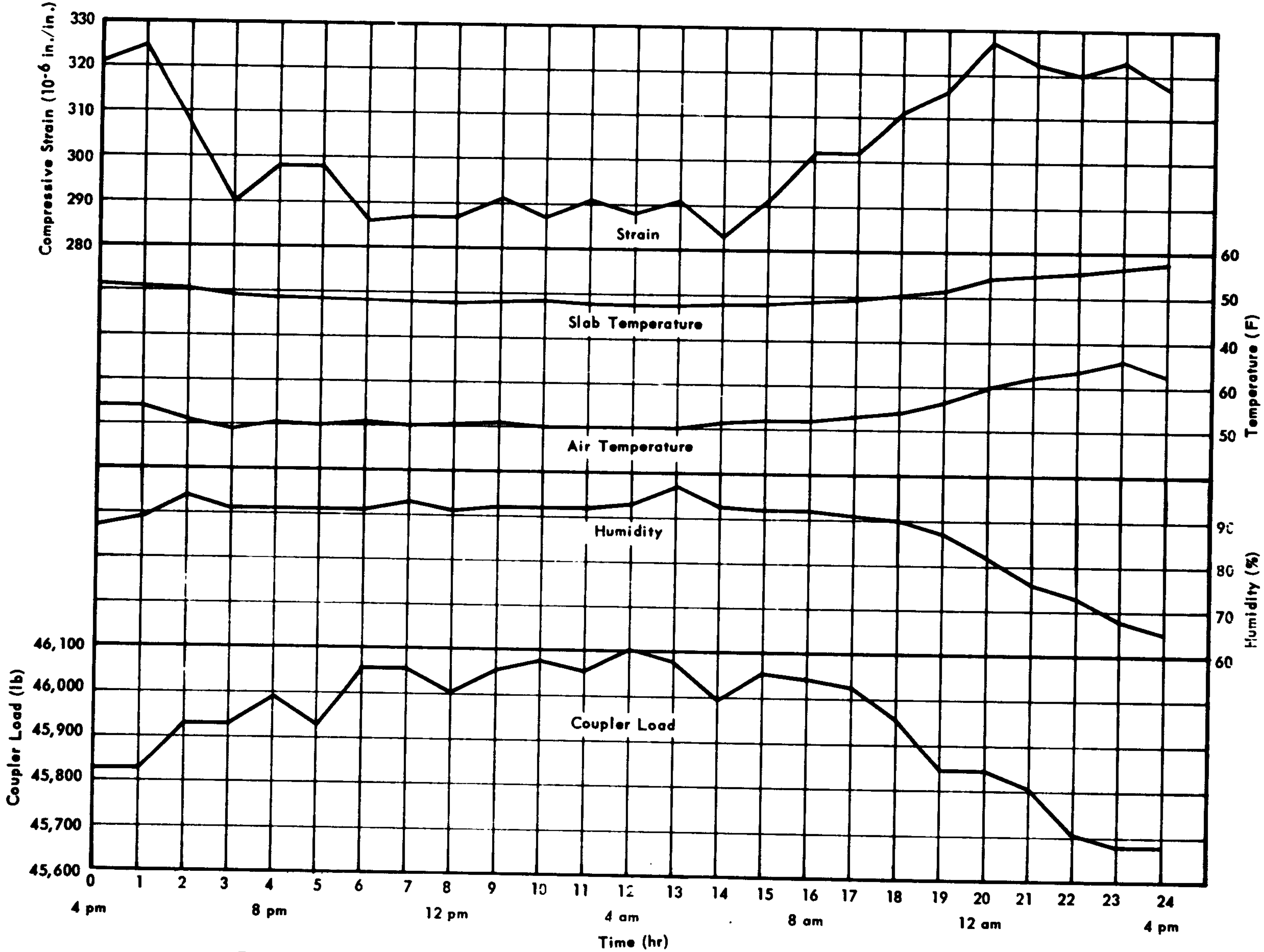
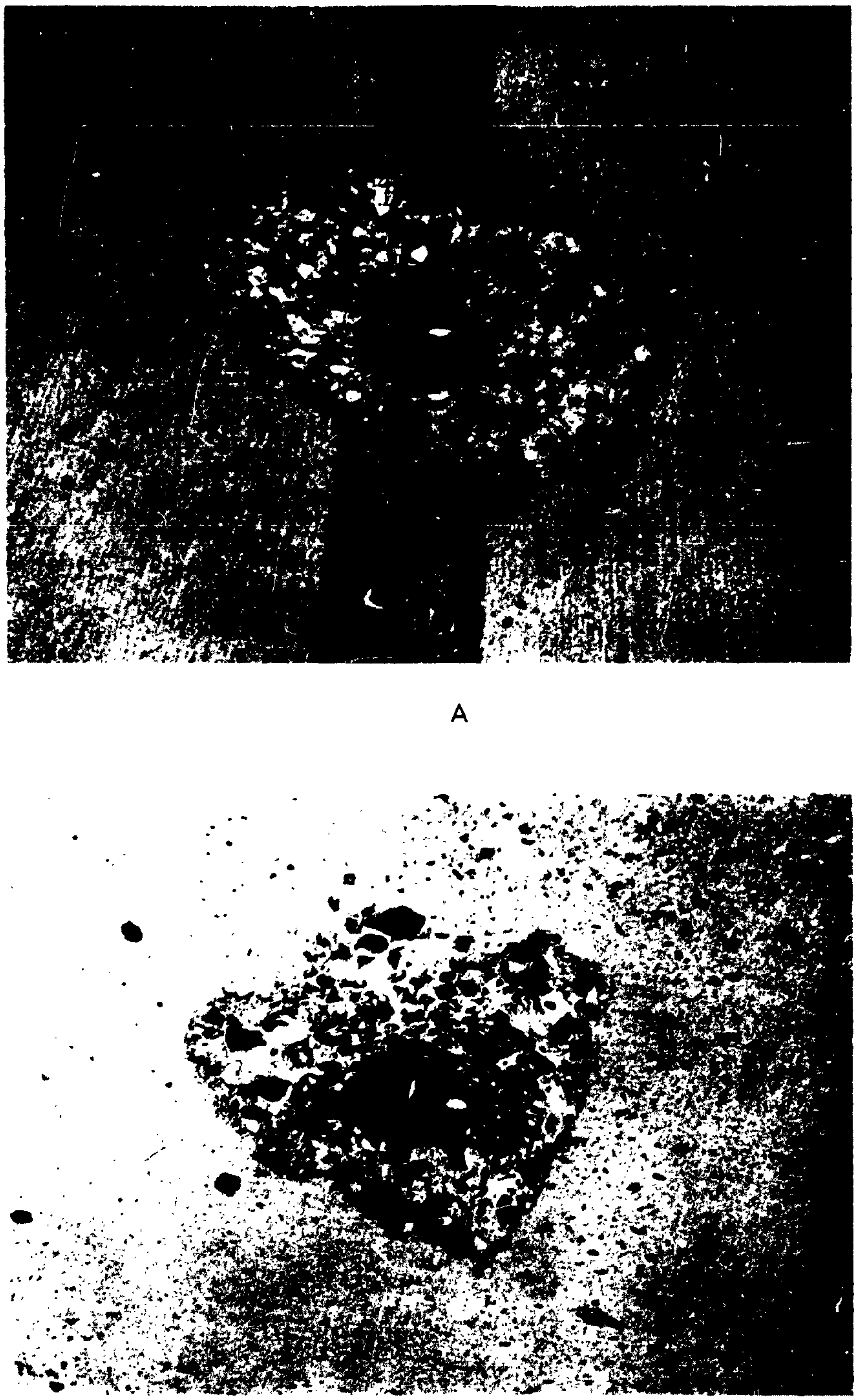


Figure S-5. Around-the-clock observations (position B-16, north 1/4 point).



A

B

Figure S-6. Spalls over instrumentation in center lane of taxiway.

TABLE I.

DATE	A-15	A-16	A-17	B-15	B-16	B-17	F-15	F-16	F-17	G-15	G-16	G-17	H-15
						LONGITUDINAL							
2-2-60			73.6			67.2			59.8			69.7	
			70.4			67.2			60.2			69.8	
*		30.9	69.8		35.1	66.7		39.5	61.9		35.4	68.9	
		39.5	69.8		35.4	66.6		39.4	61.9		36.0	68.8	
		49.8	69.7		44.4	66.5		39.9	61.9		44.3	68.8	
		59.4	69.7		52.6	66.5		47.6	61.9		53.3	68.8	
		68.7	69.6		61.2	66.4		55.1	61.8		61.4	68.8	
		73.8	69.6		65.6	66.3		59.4	61.8		65.9	68.7	
**		50.0	69.3		57.3	66.0		59.0	61.4		65.3	68.5	
*	30.8	50.0	69.1	37.2	57.1	65.6	36.5	44.2	61.1	32.8	64.9	68.2	31.0
	39.3	49.9	69.0	37.3	57.1	65.6	36.5	44.1	61.1	38.2	64.9	68.2	40.6
	49.9	49.9	69.0	41.9	57.1	65.5	43.2	44.1	61.1	47.8	64.9	68.1	50.6
	59.9	49.9	69.0	50.1	57.0	65.5	51.4	44.1	61.0	57.7	64.8	68.1	61.3
2-2-60	69.5	49.9	69.0	58.0	57.0	65.4	60.4	44.1	61.0	66.7	64.7	68.0	70.9
2-2-60	74.6	49.9	68.9	62.1	57.0	65.4	60.3	44.1	61.0	66.5	64.7	68.0	70.3
2-2-60	71.6	49.9	68.9	62.0	57.0	65.4	60.2	44.1	60.1	66.4	64.7	68.0	68.8
2-2-60	70.4	49.6	68.1	61.7	57.0	65.2	59.8	58.4	60.7	65.6	64.3	67.6	67.9
2-3-60	70.4	50.4	68.2	62.5	57.6	65.8	60.8	59.7	62.1	66.0	64.8	67.9	67.8
2-3-60	70.1	50.4	67.7	62.3	57.5	65.5	60.7	59.7	62.0	65.7	64.6	67.7	67.8
2-4-60	70.0	50.4	67.7	62.7	57.6	65.7	61.1	60.0	62.5	65.7	64.6	67.7	67.8
2-5-60	69.8	50.3	67.4	62.5	57.2	65.4	60.8	59.7	61.9	65.4	64.5	67.5	67.7
2-5-60	69.6	50.1	67.2	62.3	57.0	65.2	60.7	59.5	61.6	65.3	64.1	67.3	67.3
2-8-60	69.2	49.8	66.7	62.0	56.7	64.7	60.3	59.2	61.2	64.9	64.0	66.8	67.4
2-8-60	69.1	49.8	66.4	61.9	56.7	64.6	60.3	59.2	61.2	65.2	64.1	66.8	66.9
2-9-60	69.0	49.6	66.4	62.1	56.7	64.7	60.4	59.2	61.1	64.9	64.0	66.8	66.8
2-9-60	69.0	49.6	66.4	62.1	56.6	64.6	60.3	59.2	61.0	64.9	64.0	66.8	66.7
2-9-60	68.9	49.5	66.4	62.1	56.6	64.6	60.3	59.2	61.1	64.9	63.9	66.7	66.8
2-9-60	68.9	49.5	66.3	62.1	56.7	64.6	60.3	59.2	61.1	64.8	63.9	66.7	66.8
2-9-60	69.3	50.0	66.6	62.1	56.8	64.6	60.3	59.2	61.1	64.8	63.8	66.7	67.1
2-9-60	69.4	50.0	66.6	62.2	56.8	64.6	60.4	59.2	61.2	64.8	63.9	66.7	67.3
2-11-60	69.0	67.6	66.3	60.7	65.4	63.1	59.0	60.4	59.5	63.5	64.5	65.4	66.9
2-13-60	68.6	66.0	65.9	60.7	64.6	62.6	58.6	60.2	59.4	63.0	63.9	65.1	67.9
2-17-60	68.5	65.4	65.8	60.5	63.8	62.3	58.5	59.7	60.0	63.0	63.5	64.9	66.3
3-2-60	68.1	67.3	65.2	60.0	61.8	61.2	58.0	59.2	59.7	62.3	62.6	64.1	65.5
3-31-60	65.0	59.8	63.3	58.4	58.6	58.9	56.7	58.1	57.1	58.9	59.7	62.3	65.4
5-2-60	61.9	56.0	61.9	56.7	56.7	57.1	55.9	57.4	55.6	58.2	56.7	60.3	58.3
5-3-60	62.7	56.2	62.4	57.5	57.6	58.0	56.8	58.5	56.7	59.0	57.6	61.2	55.9
6-6-60	57.9	49.8	59.1	53.0	53.5	54.0	54.0	55.5	52.9	53.1	50.0	55.6	57.3
7-11-60	55.4	46.0	55.9	49.3	51.4	51.2	52.1	53.3	51.1	47.0	44.7	51.2	51.0
9-13-60	53.1	43.0	51.7	46.7	49.4	48.4	49.4	51.0	47.1	42.1	40.5	47.2	37.5
11-16-60	53.7	43.0	52.2	47.6	50.5	49.7	50.2	52.3	48.4	39.8	41.8	48.2	38.7
1-18-61	54.2	43.2	52.5	47.9	51.3	50.4	48.1	53.2	49.3	41.4	42.7	47.3	40.8
6-20-61	46.9	37.1	39.1	40.8	46.5	44.5	45.0	47.8	43.1	35.2	35.9	42.5	33.1
2-8-62	***	34.6	***	***	45.7	38.2	***	45.7	***	***	31.9	***	***

* Note that loads on interior couplers are higher than on end couplers. Interior cc

** Difficulty with tendon locking device caused drop in load. Full load was not agai

*** Coupler inoperative.

BLE I. INSTRUMENTED TENDON LOAD (kips)

								TRANSVERSE					AVERAGE	
17	H-15	H-16	H-17	C-81	C-82	C-83	D-81	D-82	D-83	E-81	E-82	E-83	TEMP °F	OPERAT
.7			74.1										46.1	Full jacking load
.8			71.1											Jack released
.9		31.2	70.2											Tendon 16 jacked t
.8		40.6	70.2											Tendon 16 jacked t
.8		50.2	70.2											Tendon 16 jacked t
.8		60.8	70.1											Tendon 16 jacked t
.8		71.0	70.1											Tendon 16 jacked t
.7		76.2	70.1											Full jacking load
.5		63.7	69.9											Jack released
.2	31.0	63.4	69.8											Tendon 15 jacked t
.2	40.6	63.4	69.8											Tendon 15 jacked t
.1	50.6	63.4	69.7											Tendon 15 jacked t
.1	61.3	63.3	69.7											Tendon 15 jacked t
.0	70.9	63.3	69.7											Tendon 15 jacked t
.0	70.3	63.3	69.7											Full jacking load
.0	68.8	63.3	69.7											Jack released
.6	67.9	62.9	69.2										58.2	End of work day
.9	67.8	63.2	69.1	51.8	50.9		51.7		50.2		50.8		47.7	Tendons 81, 82, 83
.7	67.8	63.0	68.8										48.8	(Jacking load 52k)
.7	67.8	62.9	69.0										46.0	
.5	67.7	62.8	68.7										49.6	Stressing of transv
.3	67.3	62.7	68.5	49.9	50.1	coupler damaged	48.9	coupler damaged	49.1	coupler damaged	49.6	coupler damaged	49.5	
.8	67.4	62.7	68.1	49.5	50.0		48.7		48.8		49.4		54.0	
.8	66.9	62.9	68.0										55.1	
.8	66.8	62.4	67.9										51.8	
.8	66.7	62.4	67.9											
.7	66.8	62.3	67.9											
.7	66.8	62.3	67.9											Stressing of longi
.7	67.1	63.0	67.8											
.7	67.3	63.0	67.8											
.4	66.9	69.6	67.4	49.2	49.8		48.4		48.6		48.8		57.5	
.1	67.9	68.7	67.1										60.4	
.9	66.3	64.5	66.8										60.7	Grouting of tendon
.1	65.5	67.8	66.4	48.7	48.9		47.7		48.0		48.5		61.7	
.3	65.4	66.0	64.9	47.3	48.2		46.0		47.0		45.9		76.1	
.3	58.3	64.7	64.2	46.3	47.6				46.1				85.5	
.2	55.9	65.2	64.5										68.0	
.6	57.3	61.9	62.1	44.2	45.9				48.4				103.8	
.2	51.0	58.3	59.9	41.6	44.1				40.6				105.5	
.2	37.5	54.6	57.4	38.5	41.9		27.9		38.3		31.3		103.4	
.2	38.7	55.2	57.6	38.3	42.8		29.0		40.7		31.6		61.1	
.3	40.8	55.6	57.8	39.6	45.2		29.4		39.8		31.7		46.0	
.5	33.1	48.3	51.6	34.2	39.3		26.2		34.9		25.8		113.4	
*	***	41.2	***	26.5	38.8		23.5		34.4		21.6		55.01	

erior couplers did not reflect complete releasing of full prestressing load applied during jack verific
not again applied until end of prestressing (2-11-60).

.OAD (kips)

C-82	C-83	D-81	D-82	D-83	E-81	E-82	E-83	AVERAGE TEMP °F	OPERATION
								46.1	Full jacking load on tendon 17
									Jack released
									Tendon 16 jacked to 30k
									Tendon 16 jacked to 40k
									Tendon 16 jacked to 50k
									Tendon 16 jacked to 60k
									Tendon 16 jacked to 70k
									Full jacking load on tendon 16 75.5k
									Jack released
									Tendon 15 jacked to 30k
									Tendon 15 jacked to 40k
									Tendon 15 jacked to 50k
									Tendon 15 jacked to 60k
									Tendon 15 jacked to 70k
									Full jacking load on tendon 15 75.5k
									Jack released
								58.2	End of work day
50.9		51.7		50.2		50.8		47.7	Tendons 81, 82, 83 fully stressed
	coupler damaged		coupler damaged		coupler damaged		coupler damaged	48.8	(Jacking load 52k)
								46.0	
								49.6	Stressing of transverse tendons
50.1		48.9		49.1		49.6		49.5	
50.0		48.7		48.8		49.4		54.0	
								55.1	
								51.8	
									Stressing of longitudinal tendons
49.8		48.4		48.6		48.8		57.5	
								60.4	
								60.7	Grouting of tendon ducts
48.9		47.7		48.0		48.5		61.7	
48.2		46.0		47.0		45.9		76.1	
47.6				46.1				85.5	
								68.0	
45.9				48.4				103.8	
44.1				40.6				105.5	
41.9		27.9		38.3		31.3		103.4	
42.8		29.0		40.7		31.6		61.1	
45.2		29.4		39.8		31.7		46.0	
39.3		26.2		34.9		25.8		113.4	
38.8		23.5		34.4		21.6		55.01	

ct complete releasing of full prestressing load applied during jack verification.

of prestressing (2-11-60).

TABLE II. STI

	LONGITUDINAL												
DATE	A-15	A-16	A-17	B-15	B-16	B-17	F-15	F-16	F-17	G-15	G-16	G-17	H-15
2-2-60	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-60													
2-2-60													
2-2-60													
2-2-60													
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2-2-60													
2-2-60	-100	-75	-110										-103
2-3-60	-91	-71	-94										-97
2-3-60	-99	-74	-103										-102
2-4-60	-98	-78	-101										-97
2-5-60	-98	-78	-105										-105
2-5-60	-98	-79	-125										-105
2-8-60	-119	-68	-106										-105
2-8-60	-111	-91	-118										-123
2-9-60													
2-9-60													
2-9-60													
2-9-60													
2-9-60													
2-9-60	-108	-92	-118										-117
2-11-60	-114	-119	-124	-101	-112	-73	-105	-121	-118	-128	-132	-95	-124
2-13-60	-124	-127	-134	-116	-127	-80	-112	-137	-111	-139	-138	-106	-141
2-17-60	-121	-126	-134	-130	-143	-90	-128	-160	-146	-145	-149	-116	-140
3-2-60	-125	-135	-147	-153	-178	-103	-151	-187	-165	-167	-179	-138	-158
3-31-60	-162	-236	-195	-197	-213	-180	-196	-240	-215	-209	-214	-183	-204
5-2-60	-188	-289	-211	-229	-261	-222	-227	-268	-254	-253	-250	-230	-293
5-3-60	-176	-215	-200	-169	-173	-155	-147	-187	-173	-168	-189	-154	-201
6-6-60	-233	-349	-263	-285	-297	-259	-268	-329	-312	-266	-286	-265	-283
7-11-60	-269	-354	-319	-340	-333	-313	-320	-369	-359	-281	-328	-321	-348
9-13-60	-314	-348	-357	-399	-370	-370	-358	-398	-395	-306	-387	-373	-400
11-16-60	-269	-312	-293	-345	-330	-308	-286	-330	-329	-290	-352	-311	-330
1-18-61	-230	-282	-267	-307	-277	-258	-236	-281	-277	-252	-299	-269	-296
6-20-61	-274	-407	***	-401	-388	-361	-376	-408	-409	-345	-396	-355	-366
2-8-62	-191	-295	-235	-328	-317	-291	-222	-317	-270	-265	-318	-290	-261

Minus (-) signs indicate compressive strains.

ABLE II. STRAINS IN CONCRETE (10^{-6} in./in.)

								TRANSVERSE					AVERAGE	
G-17	H-15	H-16	H-17	C-81	C-82	C-83	D-81	D-82	D-83	E-81	E-82	E-83	TEMP °F	OPERAT
0	0	0	0	0	0	0							46.1	Full jacking loa
														Jack released
														Tendon 16 jacke
														Tendon 16 jacke
														Tendon 16 jacke
														Tendon 16 jacke
														Tendon 16 jacke
														Full jacking loa
														Jack released
														Tendon 15 jacke
														Tendon 15 jacke
														Tendon 15 jacke
														Tendon 15 jacke
														Tendon 15 jacke
														Full jacking loa
														Jack released
	-103	-92	-110		-95	-65	-16	-22	-11	-3	-71	-77	58.2	End of work day
	-97	-91	-109	-1	-92	-74	-1	-13	-1		-66	-74	47.7	Tendons 81, 82,
	-102	-95	-110	-64	-102	-75	-8	-18	-7	-73	-72	-80	48.8	(Jacking load S
	-97	-94	-105	-71	-96	-75	-64	-71	-52	-76	-71	-81	46.0	
	-105	-94	-109	-69	-100	-75	-63	-71	-52	-81	-76	-84	49.6	Stressing of tr
	-105	-102	-117	-73	-100	-72	-63	-75	-56	-82	-80	-88	49.5	
	-105	-102	-113	-74	-105	-71	-62	-73	-47	-86	-80	-88	54.0	
	-123	-116	-135	-77	-113	-84	-84	-88	-65	-94	-92	-100	55.1	
													51.8	
													51.8	
													51.8	Stressing of lc
													51.8	
													51.8	
	-117	-110	-129	-83	-111	-78	-79	-82	-64	-92	-87	-99	51.8	
-95	-124	-112	-139	-75	-117	-75	-62	-76	-50	-82	-79	-92	57.5	
-106	-141	-144	-154	-53	-118	-80	-46	-68	-45	-85	-82	-91	60.4	
-116	-140	-147	-154	-59	-123	-84	-58	81	-53	-86	-82	-100	60.7	Grouting of ten
-138	-158	-165	-171	-61	-122	-85	-88	-100	-67	-97	-94	-108	61.7	
-183	-204	-209	-225	-78	-148	-107	-128	-133	-157	-116		-132	76.1	
-230	-293	-231	-241	-119	-163	-120	-146	-140	-183	-134		-138	85.5	
-154	-201	-210	-225	-116	-155	-124	-125	-124	-170	-134		-128	68.0	
-265	-283	-294	-300	-161	-202	-161	-213	-203	-242	-175		-171	103.8	
-321	-348	-357	-374	-190	-243	-205	-305	-302	-295	-211		-210	105.5	
-373	-400	-413	-426	-229	-295	-242	-404	-411	-371	-265	meter damaged	-255	103.4	
-311	-330	-333	-356	-236	-276	-248	-298	-282	-298	-336		-255	61.1	
-269	-296	-299	-317	-229	-198	-237	-218	-233	-237	-242		-228	46.0	
-355	-366	-374	-413	-231	-279	-235	-325	-322	-332	-246		-249	113.4	
-290	-261	-300	-224	-209	-274	-241	-230	-229	-256	-177		-222	55.01	

RANSVERSE					AVERAGE	
-82	D-83	E-81	E-82	E-83	TEMP °F	OPERATION
					46.1	Full jacking load on tendon 17
						Jack released
						Tendon 16 jacked to 30k
						Tendon 16 jacked to 40k
						Tendon 16 jacked to 50k
						Tendon 16 jacked to 60k
						Tendon 16 jacked to 70k
						Full jacking load on tendon 16 75.5k
						Jack released
						Tendon 15 jacked to 30k
						Tendon 15 jacked to 40k
						Tendon 15 jacked to 50k
						Tendon 15 jacked to 60k
						Tendon 15 jacked to 70k
						Full jacking load on tendon 15 75.5k
						Jack released
-22	-11	-3	-71	-77	58.2	End of work day
-13	-1		-66	-74	47.7	Tendons 81, 82, 83 fully stressed
-18	-7	-73	-72	-80	48.8	(Jacking load 52k)
-71	-52	-76	-71	-81	46.0	
-71	-52	-81	-76	-84	49.6	Stressing of transverse tendons
-75	-56	-82	-80	-88	49.5	
-73	-47	-86	-80	-88	54.0	
-88	-65	-94	-92	-100	55.1	
					51.8	
					51.8	
					51.8	Stressing of longitudinal tendons
					51.8	
					51.8	
-82	-64	-92	-87	-99	51.8	
-76	-50	-82	-79	-92	57.5	
-68	-45	-85	-82	-91	60.4	
81	-53	-86	-82	-100	60.7	Grouting of tendon ducts
100	-67	-97	-94	-108	61.7	
133	-157	-116		-132	76.1	
140	-183	-134		-138	85.5	
124	-170	-134		-128	68.0	
203	-242	-175		-171	103.8	
302	-295	-211		-210	105.5	
411	-371	-265	meter damaged	-255	103.4	
282	-298	-336		-255	61.1	
233	-237	-242		-228	46.0	
322	-332	-246		-249	113.4	
229	-256	-177		-222	55.01	

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